

## NOTES ON NEW ENGLAND HEPATICAЕ,—XIII.

ALEXANDER W. EVANS.

*(Continued from page 85.)*

In *P. platyphylla*, according to Müller and other recent writers who define the species in a narrow sense, the secondary stems are more or less regularly bipinnate or even tripinnate, thus giving the shoot-system a fern-like appearance; the lobes of the leaves are closely imbricated and ovate when spread out flat, the base being cordate, the apex rounded, and the margin entire or nearly so; the lobules are much smaller than the lobes, about half again as wide as the stem, ovate, gradually narrowed toward the blunt apex, scarcely or not at all decurrent at the base, recurved along the outer side, and entire along the margin; the leaf-cells average  $25\ \mu$  in diameter in the middle of the lobe, the cell-walls are thin and the trigones small and triangular; the underleaves are two or three times as broad as the stem and about twice as wide as the lobules, their outline is rotund-quadrate, and they are broadly long-decurrent on both sides, the decurrent portion being sometimes sparingly toothed, while the rest of the margin is narrowly revolute and entire; the perichaetial bracts, which are reduced to a single pair, are smaller than the leaves, and subequally bifid one-half to two-thirds, the lobe being blunt, the lobule pointed, and the margin entire throughout; the perichaetial bracteole is broadly oval, entire, and reflexed in the upper part; the perianth is shortly pyriform, bluntly three-keeled in the lower part and dorsi-ventrally compressed in the upper part, the mouth being two-lipped and bearing scattered teeth; the capsule is deeply divided into four valves, which are often unequal and further subdivided; the wall of the capsule is two or three cells thick, the cells of the outer wall having small triangular trigones; the spores measure  $45\text{--}55\ \mu$  in diameter, and the elaters measure  $8\ \mu$  in diameter and have two spirals extending to their very ends. In the var. *subsquarrosa* Schiffn., which Müller admits has been the cause of confusion, the lobes of the leaves are broadly ovate, the lobules are broader than in the type but are still narrower than the underleaves, and the cell-walls average about  $30\ \mu$  in diameter in the middle of the lobe.

A study of numerous specimens, both European and North Ameri-



can, in which the elaters were bispiral throughout, showed that some of the gametophytic characters relied upon by Müller were subject to variation, although his characterization of the species was essentially correct. In considering these variations the lobes, the lobules, the underleaves, the bracts and bracteoles, and the mouth of the perianth will be taken up in order. The leaves and underleaves discussed are in all cases those of the stem itself.

Although the lobes are normally ovate as described (see Figs. 1, 2, 4, 5) they are sometimes as broad as long and may be practically orbicular in outline (Figs. 3, 6). The cordate condition of the base, moreover, is not always as clear as might be desired. At the junction with the short keel, to be sure, the base is distinctly dilated into a cordate expansion, which may be either plane, or slightly crispate or revolute, but this expansion is by no means as constant on the other side of the lobe. In the case of the lobes shown in Figs. 4 and 5 the basal dilations are distinct enough, and similar dilations are shown in Figs. 1 and 2; but in Figs. 3 and 6 the lobe gradually narrows toward the base and is actually short-decurrent. It should be noted in this connection that the line of attachment of the lobe is strongly arched, so that the extent of the decurrent portion is not easy to define. The margin of the lobe is not quite so uniformly entire as Müller's description implies, and the portion of the margin which extends from the dorsal base to the apex is frequently more or less dentate. The teeth, which in some cases at least mark the position of slime papillae, are exceedingly irregular in size, in number and in distribution, and they are usually little more than blunt and vaguely defined projections (Figs. 1, 2, 5). Sometimes, however, they are sharper, and it is not unusual to find one or two sharp and minute teeth close to the base (Figs. 1, 2). Aside from these basal teeth, a larger and very variable tooth about midway between the base and the apex is fairly frequent. The presence of teeth on the lobe is briefly alluded to by Warnstorff.<sup>1</sup>

In the case of the lobule the line of attachment is even more sharply arched than in the case of the lobe and makes the degree of decurrence even more difficult to define clearly. Perhaps the most accurate method would be to consider the lobule decurrent only when the inner edge extends farther backward than the outer edge, and this is apparently what is implied in Müller's description. His account of the

<sup>1</sup> *Kryptogamenflora der Mark Brandenburg* 1: 270. 1902.



form and relative width of the lobule could hardly be improved upon, but here again the margin is not invariably entire as he maintains. A very few minute and irregular teeth may be present along the inner edge (especially when this is slightly decurrent) and also close to the junction with the lobe, where the lobule is more or less dilated.

Müller's description of the leaf-cells and underleaves portrays very accurately the conditions which are present in the material studied by the writer. On account of the strongly arched line of attachment of the underleaves the decurrent portion is vaguely delimited from the portion which is not decurrent, but in any case the decurrence is strongly marked.

His account of the perichaetial leaves, however, deserves a little amplification. The two bracts are usually unequal in size, the one (see Fig. 7) which is turned toward the apex of the axis bearing the female branch (that is, the outer bract) being the smaller of the two. Although the lobe and lobule are frequently of about the same size, it is more usual for the lobe to be distinctly larger than the lobule (see Figs. 7, 8), and the apices of both lobe and lobule vary from acute to obtuse or even rounded. Marginal teeth are sometimes absent but this is by no means invariably the case. In some of the bracts examined both lobe and lobule bore a number of scattered irregular teeth, some of which were little more than projecting cells while others were larger and more lobe-like. In connection with some of the teeth vestiges of slime papillae could be discerned. Similar teeth are sometimes present on the perichaetial bracteole (Fig. 9).

In European specimens of *P. platyphylla* the mouth of the perianth with its scattered teeth (Fig. 10) presents a very distinctive appearance. Each lip usually bears from fifteen to twenty teeth, and the teeth themselves vary from single projecting cells to cilia four or five cells long and one cell wide throughout or to triangular teeth as long as such cilia but three or four cells wide at the base. The teeth are exceedingly fragile, and their peculiarities cannot always be made out from old and weathered perianths. Fortunately the perianth starts to develop even when no archegonia are fertilized and, since the mouth is the first part to mature, the undeveloped perianths dissected out from unfertilized inflorescences will usually show the marginal teeth clearly.

In the North American specimens which the writer would refer to *P. platyphylla* the teeth show a tendency to be more crowded than in the European specimens, a condition which Figs. 11-14 clearly bring



out. Some of the teeth, moreover, are large and compound and show a development of secondary teeth. Teeth of this character are represented in Fig. 11, which shows one of the sinuses between the lips of the perianth, and also in Fig. 14, which unfortunately is taken from a specimen without mature capsules. Sometimes a few surface cells close to the mouth project slightly, as shown in Fig. 13.

The sporophytic characters of *P. platyphylla* are well described by Müller. It might perhaps be added that the two spirals in the elaters are continuous at the extreme ends and form loops. This interesting feature is brought out by Schiffner and is very evident in both European and North American material. The writer is inclined to follow Schiffner and Müller in restricting the name *P. platyphylla* to plants in which the elaters are bispiral. The difficulties in determining material without capsules will be discussed under *P. platyphylloidea*.

The third species of *Porella* which has been reported from New England is *P. rivularis* (Nees) Trevis., the full description of which by Howe<sup>1</sup> may be consulted. This species has been more or less confused with both *P. pinnata* and *P. platyphylla*. Although the name *P. rivularis* has been in widespread use for a considerable period, Müller<sup>2</sup> has recently shown that the oldest synonym for the species is *Jungermannia Cordaeana* Hüben.<sup>3</sup> and therefore describes it under the old name *Madotheca Cordaeana* (Hüben.) Dumort.<sup>4</sup> In order to avoid the publication of a new combination, Dumortier's name will be employed in the present paper. *M. Cordaeana* is especially at home on stones and rocks along mountain brooks. In such localities it is more or less subject to inundation, but in dry seasons may be exposed to the air for considerable periods. In very shady places it sometimes grows on trees close to the base. Müller comments on the variability of the species, due to environmental conditions, and notes its occurrence in North America, northern Africa, and western Asia, as well as in Europe. In the writer's opinion, however, the records not only from New England but from other parts of eastern North America are based on incorrect determinations, as will be shown below.

In general appearance *M. Cordaeana* resembles *P. pinnata* very

<sup>1</sup> Bull. Torrey Club 24: 519. 1897.

<sup>2</sup> Rabenhorst's Kryptogamen-Flora 6<sup>2</sup>: 585. 1915.

<sup>3</sup> Hapat. Germ. 291. 1834.

<sup>4</sup> Recueil d'obs. sur les Jung. 11. 1835.



strongly although its relationships with *P. platyphylla* are perhaps closer. The stems are pinnate or sparingly bipinnate, and the shoot-system on account of the regularity of the branching may assume a fern-like form. This, however, is always less marked than in typical specimens of *P. platyphylla*, and in some cases, especially in drier situations, the branching may be very irregular.

The lobes, lobules, and underleaves differ from those of *P. pinnata* in being usually more or less dentate. The dentation, in fact, although not to be compared with that of the European *P. laevigata* (Schrad.) Lindb. in its typical forms, is commonly more marked than in *P. platyphylla* and its immediate allies, and often helps in determining sterile specimens of *M. Cordaeana*. Taking up the lobes (of the stem-leaves) more in detail they are found to be ovate and rounded at the apex, much as in *P. platyphylla*. In some cases they are not attached to the lobule at all, no keel being present. In other cases an extremely short keel can be demonstrated. Whether a keel is developed or not the lobe is usually distinctly dilated at the carinal base (as it may be called) and may therefore be described as cordate; at the dorsal base the cordate condition is much less frequent, the lobe in most cases gradually narrowing into a short decurrent portion. The teeth of the lobe are much like those of *P. platyphylla* but tend to be sharper, more distinct and more numerous.

The lobules afford some of the most distinctive characters of the species. They are usually much smaller than in *P. platyphylla* and are ovate to lanceolate in form, the apex varying from obtusely pointed to acute. On branch-leaves the apices may even be acuminate. The margins of the lobules are often irregularly revolute in places, the whole lobule being thus variously contorted or crispate. The line of attachment is sharply arched and the inner edge is usually twice or three times as long as the outer, so that the decurrence is very evident. Sometimes, when no keel is present, the outer edge extends farther backward than the lobe in the form of a narrow wing, but this is never so long as the inner edge. Marginal teeth or cilia are restricted for the most part to the decurrent portions. They are exceedingly variable in number, in form, and in size, but are usually more in evidence than in the lobules of *P. platyphylla*.

The leaf-cells average about 30  $\mu$  in the middle of the lobe and are therefore a trifle larger than in typical forms of *P. platyphylla* and considerably larger than in *P. pinnata*. They have thin walls and small



but distinct trigones. The underleaves are even more decurrent than in *P. platyphylla* and the decurrent portions tend to be more strongly toothed. In other respects the underleaves are much the same in the two species, although in *M. Cordaeana* they are distinctly narrower, being only a little wider than the stem.

The female branches, which bear a single pair of bracts, sometimes arise directly from the stem and sometimes from a primary branch. In most cases, especially when the branch springs directly from the stem the contrast in size between the bracts is very marked, the inner bract being much larger than the outer. In the outer bract the lobule is narrower than the lobe but almost equals it in length; in the inner bract the lobe tends to be longer and broader than the lobule, although it is always distinctly smaller than the lobes of ordinary leaves. With respect to the apices of the lobes and lobules there is much variety. The lobe of the inner bract, however, is usually rounded at the apex, while the lobe of the outer bract and the lobules of both bracts are usually more or less sharply pointed. The bracteole is much the same as in related species. Both bracts and bracteole are variously toothed, the teeth varying from slightly projecting cells to cilia or broader teeth two to four cells long. The teeth are irregularly scattered but tend to be closer together in the basal regions, where they sometimes show vestiges of hyaline papillae.

The perianth is especially remarkable on account of the character of its mouth. In the other North American species of *Porella* the mouth is variously ciliate; in *M. Cordaeana* it is subentire or vaguely crenulate from projecting cells. Sometimes a slight lobing or indistinctly sinuate appearance is present, but even then the mouth is very different from what is found in other species. The sporophytic characters are much as in *P. platyphylla*, the elaters being bispiral throughout their entire length.

In separating *M. Cordaeana* from *P. platyphylla* the subentire mouth of the perianth, the large inner perichaetial bract, and the small and long-decurrent lobules yield the most helpful characters. The mouth of the perianth will likewise distinguish it from *P. pinnata*, although there is now little danger of confusing these two species even when sterile, on account of the blunt, entire, and transversely attached lobules and underleaves in *P. pinnata*.

Although *M. Cordaeana* is not uncommon from the Rocky Mountains westward very few stations from the eastern part of North



America have been reported. In New England there is one record for Connecticut<sup>1</sup> and one for Vermont.<sup>2</sup> The Connecticut record was based on poorly developed male specimens collected in 1856 by D. C. Eaton in the town of Cheshire; the Vermont record, on a few fragmentary specimens, apparently quite sterile, which were found in 1910 by F. Dobbin in the town of Jamaica. These specimens do not agree with the European and western American material of *M. Cordaeana*. The Connecticut specimens are hardly determinable but clearly belong to the *P. platyphylla*-group. The Vermont specimens agree closely with the plants from Willoughby, which are listed above under *P. platyphylla*, and are therefore included under the same species.

Only two other reports from the region east of the Mississippi are known to the writer. One was based on specimens collected by W. S. Sullivant near Yellow Springs, Ohio<sup>3</sup>; the other on specimens collected by T. P. James at Narrowsville, Bucks County, Pennsylvania.<sup>4</sup> These specimens show rather broad lobules with a short decurrence and very immature perianths, in which the teeth at the mouth are scattered. It seems safe to refer them to *P. platyphylla*, as is done above. Two records made by the writer, one from Stair Portage, Minnesota (*MacMillan, Lyon & Brand 42*),<sup>5</sup> and the other from near Estabrook, Platte Canyon, Colorado (*J. M. Holzinger*),<sup>6</sup> seem to be equally open to criticism. The specimens in both cases should be referred to the *P. platyphylla*-group and probably represent a poorly developed form of *P. platyphylla* itself; unfortunately it is not possible to reach a positive conclusion.

According to the statements just made the occurrence of *M. Cordaeana* in eastern North America seems to be improbable. There are other European species, however, which are restricted, in North America, to the Pacific Coast region, so that the distribution of *M. Cordaeana* in this respect is by no means unique.

5. PORELLA PLATYPHYLLOIDEA (Schwein.) Lindb. Hepat. Utveckl. 20. 1877 (as *Porella platyphylloides*). *Jungermannia platyphylloidea*

<sup>1</sup> See Howe, Bull. Torrey Club 24: 520. 1897.

<sup>2</sup> RHODORA 14: 18. 1912.

<sup>3</sup> Distributed by Austin in Hep. Bor.-Amer. 91b. 1873. The habitat is given on the label as follows: "On shaded rocks, near Yellow Springs, Ohio, Sullivant; also in California, Bolander." In the writer's set the specimens are unlike any form of *Porella* known from California and doubtless represent Sullivant's plants.

<sup>4</sup> See Porter, Cat. Bry. and Pterid. Pennsylvania 8. 1904.

<sup>5</sup> Minnesota Bot. Stud. 3: 144. 1903.

<sup>6</sup> Bryologist 18: 47. 1915.



Schwein. Spec. Fl. Am. Sept. Crypt. 9. 1821. *Madotheca platyphylloidea* Dumort. Recueil d'Obs. sur les Jung. 11. 1835. *Madotheca Jackii* Schiffn. Lotos 48: 348. 1900. *Porella Jackii* C. Jensen, Danmarks Mosser 1: 240. 1915. [Text figs. 14-40].

On rocks and trunks of trees. Maine: Auburn (*E. D. Merrill* 8); Mt. Desert Island (*E. L. Rand*); vicinity of Schoodic Lake, Piscataquis County (*A. W. E.*); Bristol and Madison (*E. B. Chamberlain* 1344, 1503); Hebron (*J. A. Allen*); Southwest Harbor (*S. A. Linsey*); Pleasant Ridge Township, Somerset County (*E. B. Chamberlain* 3287); Farmington (*J. F. Collins* 1173); near Prospect Harbor (*A. R. Northrop*). New Hampshire: Crawford Notch (*E. Faxon*); Jackson and Franconia Notch (*A. W. E.*); Madison (*H. H. Bartlett* 1250, 1251); White Mountains ("E. T. 7"). Vermont: Willoughby (*A. Lorenz*); Leffert's Mills, Chittenden County (*C. M. Cooke, Jr.*); Bolton (*A. W. E.*); Newfane (*M. A. Howe*, distributed in Amer. Hep. 87, as *M. platyphylla*). Massachusetts: Dedham and Brookline (*E. Faxon*); West Newbury (*C. C. Haynes*); Woods Hole (*A. W. E.*); Brewster (*F. S. Collins*). Rhode Island: Providence and North Kingston (*J. F. Collins* 599, 798); Chepucket (*G. W. Burlingame* 207). Connecticut: Hamden (1858), New Haven, Danbury, Bethany and East Haven (*D. C. Eaton*); Kent, Ledyard, Hamden, Orange, West Hartford, Meriden and Salisbury (*A. W. E.*); Plainfield (*J. L. Sheldon*); Stafford, Portland, North Haven, Bolton and Vernon (*G. E. Nichols*); Southington (*E. B. Chamberlain* 1437); Redding (*C. C. Haynes*); Killingworth (*F. W. Hall*); Canterbury (*S. B. Hadley*); Portland and Glastonbury (*F. Wilson*); East Lyme (*C. B. Graves*); Durham (*A. Lorenz*). To give a further idea of the distribution of the species in North America the following stations outside of New England may be given. Nova Scotia: near Indian Brook and in the valley of the Barrasois, Cape Breton (*G. E. Nichols* 42, 65, 1545); Kentville (*H. B. Bailey*); Big Intervale and Baddeck, Cape Breton (*J. Macoun* 55, 58); near Pictou (*Howe & Lang* 584); near Yarmouth (*J. Macoun* 24); Sandy Cove (*J. D. Lowe* 22). Ontario: Ottawa (*J. Macoun*, distributed in Can. Hep. 9, as *P. platyphylla*); Algonquin Park (*J. Macoun* 135); Owen Sound (*Mrs. Roy*). New York: Chittenago and Clarkson (*D. C. Eaton*, 1855); Yonkers (*E. C. Howe*); Murray Island, Jefferson County (*Robinson & Maxon* 106); Mt. Colburn (*E. G. Britton* 24), somewhat doubtful; Undercliff (*C. C. Haynes* 330); Onteora (*A. M. Vail* 3); Bear's Head, Sand Lake (*S. H.*



*Burnham 2*). Pennsylvania: Erie (*L. G. Olmstead*, 1843); Glen Riddle and Moylan, Delaware County (*A. F. K. Krout*), doubtful; near Conewago, mouth of the Tucquan, near Safe Harbor and near Penryn (*J. K. Small 21, 23, 7, 20, 11*); Sayre (*W. C. Barbour 8*). Ohio: Columbus (*W. S. Sullivant*, 1842); Fairfield County (*E. C. Miller*). Kentucky: Berea (*N. L. T. Nelson 33*). Maryland and District of Columbia: near Washington (*J. M. Holzinger*); High Island (*F. H. Knowlton*). Virginia: Hungry Hollow (Smyth County), McMillan's Cave (near Marion), Brushy Mountain and Holston River (*J. K. Small 44, 71, 85*); Marion, Dickey's Creek, Pine Mountain, White Top summit, and Holston River (*E. G. Britton & A. M. Vail 81-84, 110-115, 33, 128, 58*). West Virginia: Morgantown and Beaver Spring (*C. F. Millspaugh 1291, 1292, 1530*); Cheat Bridge (*J. L. Sheldon 2519*). North Carolina: Salem (*Schweinitz*, type of *Jungermannia platyphylloidea*); Hendersonville (*A. M. Smith*); Blowing Rock, Aunt Sallie Ridge and Grandfather Mountain (*J. K. Small 40, 41, 35, 36*). Georgia: Athens (*R. M. Harper 59a*); Stone Mountain (*J. K. Small 95, 98, 109*); near Thompson, McDuffie County (*H. H. Bartlett 917*). Florida: West Florida (*A. W. Chapman*). Indiana: near Greencastle (*L. M. Underwood*). Wisconsin: Gordon, Douglas County (*C. H. Conklin 157*); near Mason, Lake Superior region (*L. S. Cheney 5166*). Minnesota: Knife River and Albert, St. Louis County (*G. H. Conklin 841, 922*); Old Iron Trail (*J. M. Holzinger*). Missouri: St. Louis (*T. Drummond*); Horine, Cliff Cave, Creve Coeur Lake and Chadwick (*N. L. T. Nelson 770½, 820, CC, 1616, 15*); Silver Mines, Iron County (*C. Russell 4*). New Mexico: Mogollon Mountains, Socorro County (*E. O. Wooton*); Eagle Creek, Lincoln County (*E. O. Wooton*), doubtful; West Fork of the Gila River (*O. B. Metcalfe 490*). A number of these stations have already been recorded under the name *P. platyphylla*, and the specimens from Jackson, New Hampshire, have been figured under this name by the writer.<sup>1</sup> The specimens distributed by Austin (*Hep. Bor.-Amer. 89, 90*, as *Madotheca platyphylla* and *M. platyphylla* var.) should also be referred to *P. platyphylloidea*; they were probably collected in New Jersey although this fact is not stated on the labels. The writer has seen no specimens from Mexico. In Europe Müller gives the species a continental distribution, citing specimens from Germany, Austria and northern Italy only.

<sup>1</sup> *Plant World 2: pl. 5. 1899.*



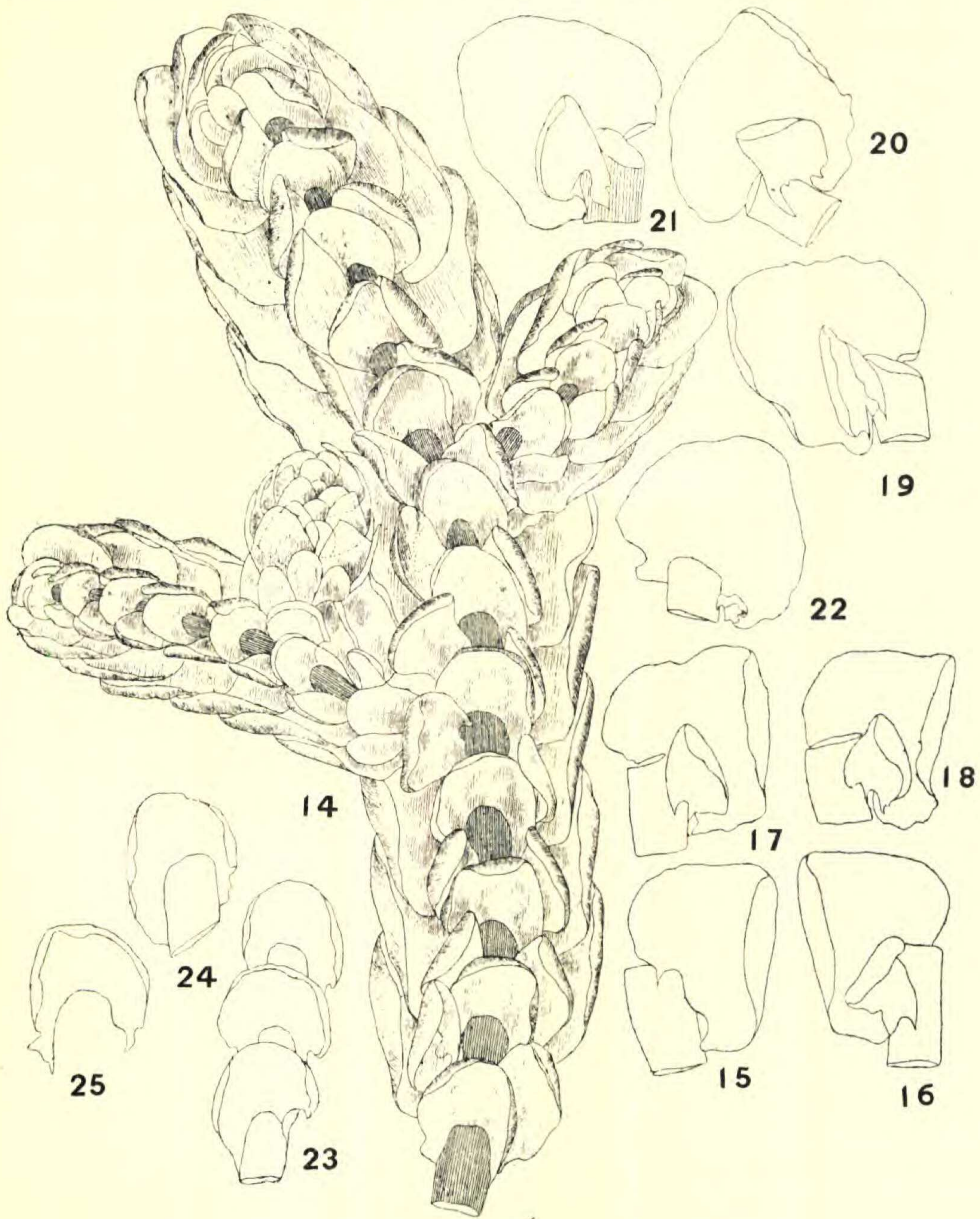
In the account just given of *P. platyphylla* the history of *P. platyphylloidea* is likewise briefly treated. When Schiffner proposed *M. Jackii* as a new species he stated that it differed from *M. platyphylloidea* in its simply pinnate shoots and slightly larger cells, the North American species being described as closely bipinnate. Müller considers these differences of but slight importance and was, moreover, unable to confirm them in his study of authentic specimens of the two species in question. He therefore reduced *M. Jackii* to synonymy and the writer, from a study of European specimens cited by Müller, sees every reason for following his example.

In *P. platyphylloidea*, according to Müller's accounts, the plants are somewhat more robust than in *M. platyphylla*, and the secondary stems are usually only once-pinnate with branches of variable length, the shoot-system thus acquiring an irregular contour; the lobes of the leaves are closely imbricated and suborbicular (usually as broad as long or even broader), the base being crispate and auriculate, the apex broadly revolute, and the margin practically entire; the lobules are about twice as wide as the stem, broadly ovate, broadly rounded at the apex, shortly or not at all decurrent, and slightly revolute along the margin; the leaf-cells average  $25\ \mu$  in diameter in the middle of the lobe, and the development of the trigones varies according to the environment; the underleaves are of about the same width as the lobules, their outline is suborbicular, and they are shortly decurrent on both sides, the decurrent portions sometimes bearing a few small and scattered teeth, while the rest of the margin is entire and sometimes revolute; the perichaetial bracts, which are reduced to a single pair as in *P. platyphylla*, are smaller than the leaves, the lobe is elongated-ovate and entire, and the lobule is only one-third as large as the lobe, ovate in form, rounded at the apex, and entire, or indistinctly dentate; the perichaetial bracteole is broadly oval, entire or sparingly toothed in the basal region; the perianth is ovate in outline, narrowed toward the two-lipped mouth and shortly dentate or (in Schiffner's words) densely ciliated with cilia one to five cells long. The capsules split as in *P. platyphylla* and the spores average about  $46\ \mu$  (according to Schiffner); the elaters are mostly  $9\text{--}10\ \mu$  in diameter and usually show a single spiral band throughout their length; in some cases two spiral bands are present in the middle of the elater but only one extends to each end.

Since *P. platyphylloidea* is the commonest species of *Porella* in



eastern North America the writer has had abundant material for study. The North American specimens have been carefully compared with European material. A few slight deviations from the



Figs. 14-25. *PORELLA PLATYPHYLLOIDEA* (Schwein) Lindb.

14. Branch bearing a male inflorescence and two sterile branches, ventral view. 15. A leaf, dorsal view. 16-21. Leaves, ventral view. 22. A leaf at the base of a branch. 23-25. Underleaves. All magnified about 14 times. The figures are a reproduction of those by Gottsche, distributed with Gottsche and Rabenhorst's *Hepaticae europaeae* 372. They were drawn from an authentic North American specimen of *Jungermannia platyphylloidea* Schwein. in the Lindenberg herbarium.



published accounts of the species have been noted and these will be considered in order. The differences between *P. platyphylloidea* and *P. platyphylla* will then be discussed.

Although the lobes (of the stem-leaves) are usually orbicular and are sometimes even broader than long, as shown in Figs. 16-21, 26-29, it is not unusual for some of the leaves to be longer than broad and thus to approach in form the typical leaves of *P. platyphylla*, a condition shown in Fig. 30. At the junction with the keel the cordate expansion is strongly developed and tends to be conspicuously crispate or irregularly folded. On the other side of the lobe, however, although a cordate expansion may be present, as shown in Fig. 30, it is much more usual for the lobe to narrow gradually and show a short decurrence, as shown in Figs. 15, 26-29. Marginal teeth are often present, just as they are in *P. platyphylla*, and tend if anything to be more pronounced, but they are essentially the same in character.

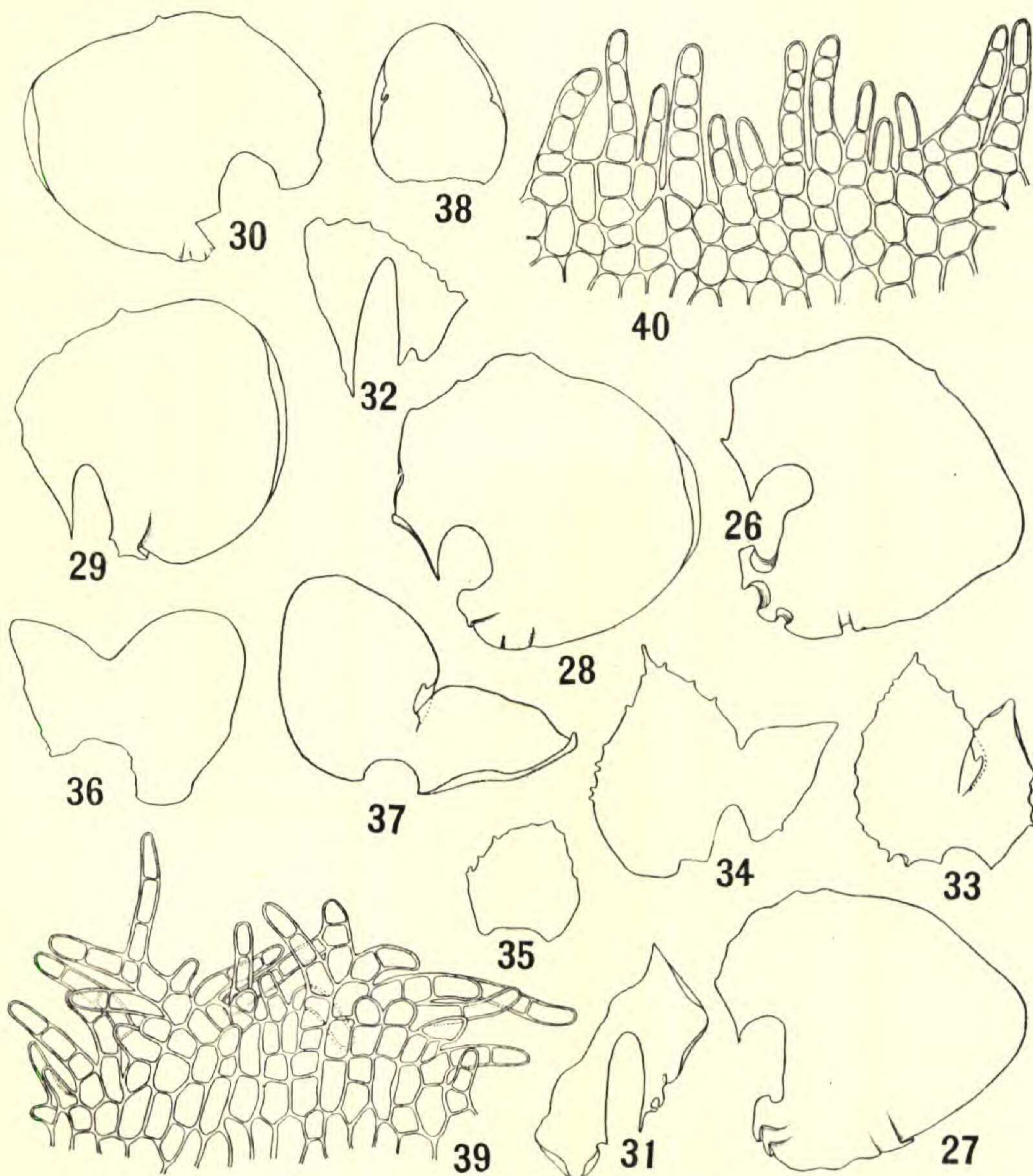
In typical material of *P. platyphylloidea* the lobules are about as wide as the underleaves and have broad rounded apices and narrowly revolute margins. Unfortunately this typical condition is not always realized, a fact clearly brought out by Gottsche's figures of the species, which were drawn from an authentic American specimen in the Lindenberg herbarium. These figures were issued with No. 372 of Gottsche and Rabenhorst's *Hepaticae europaeae*, and are here reproduced as Figs. 14-25. It will be noted that many of the lobules shown are narrower than the underleaves, that some of them are narrowed toward the apex, and that the outer side only is recurved. The objection might perhaps be brought forward that Gottsche's figure was drawn from a male individual, and that a plant often produced androecia before it had reached the full luxuriance of which it was capable.<sup>1</sup> The writer, however, has observed female plants, bearing mature sporophytes with unispiral elaters, in which the lobules were fully as narrow as those in Gottsche's figures and essentially like them in other respects. Among plants of this character the Virginia specimens collected by J. K. Small at the Falls of Holston River (No. 85) might be especially mentioned, although similar specimens have been found in other localities. It is clear, therefore, that the characters drawn from the form and relative size of the lobule must be interpreted with discretion. The remarks made under *P. platyphylla* with regard to the degree of decurrence and the occasional presence of teeth near

<sup>1</sup> Compare Goebel, *Organographie*, 2d ed. 142. 1913.



the base of the lobule would apply equally well to *P. platyphylloidea*, although the tendency to bear teeth is rather more pronounced in the latter species.

The writer can add nothing of importance to the published descrip-



Figs. 26-40. *PORELLA PLATYPHYLLOIDEA* (Schwein.) Lindb.

26-30. Lobes of stem leaves,  $\times 15$ . 31, 32. Lines of attachment of lobules, 31 showing keel on left hand side, and 32, on right hand side,  $\times 35$ . 33-35. Bracts and bracteole from a single involucre,  $\times 25$ . 36-38. Bracts and bracteole from another involucre,  $\times 25$ . 39, 40. Teeth from mouths of perianths,  $\times 200$ . Figs 26, 27, 31, 33-35, 39 were drawn from a specimen collected on Mt. Carmel, Hamden, Connecticut, by the writer; Figs. 28-30, 32, from a specimen of *Madotheca Jackii* Schiffn., collected at Salem in Baden, Germany, by J. B. Jack and distributed by Gottsche & Rabenhorst, Hep. eur. 140; Figs. 36-38, from another specimen collected at Salem in Baden, Germany, by J. B. Jack; Fig. 40, from a specimen collected at Madison, New Hampshire, by H. H. Bartlett, 1250.



tions of the leaf-cells and the underleaves (see Figs. 14, 23-25). In the case of the female inflorescence, however, a few remarks may be in place. Although the perichaetial bracts are almost invariably reduced to a single pair, a second pair is occasionally developed. When this is the case the pair next to the perianth is essentially the same as when a single pair is present. Müller implies that there is a much greater discrepancy in size between the lobe and lobule than in *P. platyphylla*, but this idea is not borne out by the writer's observations. As a matter of fact the bracts (Figs. 33, 34, 36, 37) are much the same as in *P. platyphylla* and are subject to the same variations in the character of the apex and the degree of the marginal dentation; sometimes, indeed, the apex is tipped with an apiculum (Figs. 33, 34). In the case of the bracteole teeth are occasionally present in the upper part as well as in the basal region (Figs. 35, 38).

The mouth of the perianth is more contracted in *P. platyphylloidea* than in *P. platyphylla* and is densely ciliate. The cilia are usually one cell wide and vary from one to five or more cells in length (as Schiffner states); sometimes compound cilia are present with secondary cilia along their sides, but simple unbranched cilia are the rule. The cilia are sometimes straight as in Fig. 40 but it is much more usual for them to be variously contorted as in Fig. 39. Projecting cells in the neighborhood of the mouth are sometimes present as in the North American specimens of *P. platyphylla* (see Fig. 39).

In studying a large series of capsules of *P. platyphylloidea* the elaters have shown for the most part a single spiral throughout their length. Elaters with two spirals in the middle portion have, nevertheless, been repeatedly observed, and in some capsules a rather high percentage of the elaters have been of this type. In no case, however, has an elater with two spirals throughout its entire length been noted, so that in the elaters at least the differences between *P. platyphylla* and *P. platyphylloidea* are definite and constant. In distinguishing the two species the most trustworthy differences are, in fact, those drawn from the elaters. Boulay<sup>1</sup> comments on the difficulty of using sporophytic characters in the genus at all on account of the habitual sterility of material, but this difficulty does not detract in any way from the importance of such characters.

In the absence of mature capsules the mouth of the perianth, even when undeveloped perianths are the only ones available, should be

<sup>1</sup> *Musc. de la France* 2: 18. 1904.



examined. This can best be done by dissecting off the upper part of the perianth, splitting it, and spreading it out flat, and care must be taken in making sure that the teeth or cilia at the mouth are still intact. The study of old and disintegrated perianths has led to many errors. The teeth or cilia yield characters which can be employed with safety. In *P. platyphylla* they are scattered; in *P. platyphylloidea*, densely crowded. It has already been noted that in North American specimens of *P. platyphylla* the teeth are more numerous than in the European material; they are never so numerous, however, as in *P. platyphylloidea* and do not present the appearance of being everywhere close together.

If neither capsules nor perianths are present the much less satisfactory characters drawn from the habit of the plants and from the leaves are still available. If the specimens to be determined are robust, if the stems are irregularly pinnate, if the lobes of the stem-leaves are as broad as long and distinctly crispate at the base, and if the lobules are about as wide as the underleaves and rounded at the broad apex, there can be little question that the plants should be referred to *P. platyphylloidea*. If, on the other hand, the specimens are of a medium size, if the stems are regularly bipinnate, if the lobes of the stem-leaves are longer than broad and scarcely or not at all crispate at the base, and if the lobules are distinctly narrower than the underleaves and show a tapering toward the apex, a determination as *P. platyphylla* is indicated. Unfortunately there are cases where the vegetative characters by themselves can hardly lead to a positive decision. This is true not only of poorly developed specimens but also of well-developed specimens in which the distinctive characters just given are differently grouped; where, for example, an irregularly pinnate stem is associated with narrow lobules or with lobes which are distinctly longer than broad. Male specimens seem to be especially troublesome in this respect and sometimes fail to show the characters of the species clearly when female plants growing with them are typically developed. In the writer's opinion Schiffner's var. *subsquarrosa*<sup>1</sup> of *P. platyphylla*, based on European material, includes forms which cannot be determined positively by means of the vegetative characters alone; and very similar American specimens are listed above under *P. platyphylloidea* on the basis of perianths and capsules.

It is evident from the remarks just made that *P. platyphylloidea*,

<sup>1</sup> Lotos 48: 346. 1900.



even if recognized as a valid species, must be regarded as a "kleine Art" in the *P. platyphylla*-group. According to our present knowledge the range of the true *P. platyphylla* is northern rather than southern in North America, but it must be admitted that our knowledge is still incomplete. Perhaps when more is known about the geographical distribution of these two species it may be possible to utilize this knowledge in the determination of doubtful specimens.

Schiffner's *Madotheca Baueri* has as yet been reported from Europe only. The writer has not had access to Schiffner's types but has examined a series of authentic specimens including those in Jack, Leiner & Stizenberger's *Kryptogamen Badens 164*, and in Rabenhorst's *Hepaticae europaeae 52*, both of which are referred by Müller to *M. Baueri*. No. 164 was collected by F. Himmelseher near Salem in Baden and No. 52 by A. Röse near Schnepfental in Thuringia. The specimens studied agree closely with the published descriptions but indicate that the validity of *M. Baueri* is fully as doubtful as that of *M. platyphylloidea*. The characters emphasized by Schiffner are the following: the large size and irregular branching; the broadly elliptical to almost orbicular lobes; the distant, small, almost plane underleaves, broadly rounded at the apex; the large leaf-cells, averaging about  $36\ \mu$  near the apex of the lobe; the narrow mouth of the perianth with crowded cilia; and the elaters with one spiral, except in the median portion where two are present. Müller describes the cells in the middle of the lobe as  $30\text{--}35\ \mu$  in diameter, and adds that one or two blunt teeth are borne on the margin of the lobe, that the lobule is long decurrent and often toothed in the decurrent portion, that the perichaetial bracts are shortly and bluntly denticulate throughout, and that the crowded cilia at the mouth of the perianth are three or four cells long. Aside from the features mentioned *M. Baueri* is described as being much like *P. platyphylla*.

The material studied by the writer brings out the fact that many of the differential characters relied upon are subject to great variation. This is particularly true of those drawn from the form and dentation of the leaves. The large leaf-cells afford a character which deserves more weight. The difference in size, when these cells are compared with those of *P. platyphylla* and *P. platyphylloidea*, is usually pronounced, although Müller brings out the fact that in the variety *subsquarrosa* of *M. platyphylla* the cells approach those of *M. Baueri*. In the mouth of the perianth the resemblance to *P. platyphylloidea* is particularly



striking, and, according to the description, the characters drawn from the elaters would indicate a relationship with this species rather than with *P. platyphylla*. Unfortunately the structure of the elaters is not quite so uniform as Schiffner implies. In the single mature capsule examined by the writer (taken from *Kryptogamen Badens 164*), some of the elaters agree closely with Schiffner's description; in others, however, the unispiral portions at the ends are very short, and a few elaters are bispiral throughout, the two spirals forming a loop just as in *P. platyphylla*. In its elaters, therefore, *M. Baueri* is intermediate between *P. platyphylloidea* and *P. platyphylla*.

The additions to local state floras, not already mentioned on the preceding pages, are as follows:—

For Maine. *Cephalozia macrostachya*, Round Mountain Lake and vicinity, Franklin County (*A. Lorenz*).

For New Hampshire. *Calypogeia sphagnicola*, Mt. Monadnock (*A. Lorenz*).

For Massachusetts. *Riccia Lescuriana*, Northampton (*A. Lorenz*). *Riccia sorocarpa*, Deerfield (*A. Lorenz*). *Lophozia alpestris* and *Sphenolobus Hellerianus*, Sheffield (*A. Lorenz*). *Lophozia attenuata* and *Sphenolobus minutus*, Mt. Everett, town of Mt. Washington (*A. Lorenz*).

As already noted the New England records for *Scapania gracilis* and *Porella rivularis* and the Vermont record for *Scapania dentata* should be erased. The New Hampshire, Massachusetts and Rhode Island records for *Porella platyphylla*, which were marked in the Revised List with the sign "+," should now be marked with the sign "−." The Massachusetts record for *Grimaldia fragrans*, however, which was marked in the Revised List with the sign "−," may now be marked with the sign "+," the necessary specimens having been collected by *A. Lorenz*.

The census of New England Hepaticae now stands as follows: Total number of species recorded, 185; number recorded from Maine, 131, for New Hampshire, 138; for Vermont, 120; for Massachusetts, 110; for Connecticut, 141; common to all six states, 59.

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## EXPLANATION OF PLATE.

## PORELLA PLATYPHYLLA (L.) Lindb.

1-6. Lobes of stem-leaves,  $\times 15$ . 7-9. Bracts and bracteole from a single involucre,  $\times 25$ . 10-14. Teeth from mouths of perianths,  $\times 200$ . Figs. 1, 2, 7-10 were drawn from a specimen collected near Florence, Italy, by E. Levier, and determined by Schiffner as the typical form of *Madotheca platyphylla*; Fig. 3, from a specimen collected at Fiesole, near Florence, Italy, by E. Levier, and determined by Schiffner as *M. platyphylla* var. *subsquarrosa*; Figs. 4-6, 11, from a specimen collected at Bic, Quebec, by the writer 98; Fig. 12, from a specimen collected at New Haven, Connecticut, by D. C. Eaton; Fig. 13, from a specimen collected at Vasa, Minnesota, by N. L. T. Nelson 945½; Fig. 14, from a specimen collected at New Milford, Connecticut, by the writer.

**NYMPHAEA MAGNIFICA.**—The crimson night-blooming waterlily of India is well known by reason of a century of cultivation in European and American gardens. It was first described in print in Hooker's *Paradisus Londinensis*. The article is illustrated with two colored plates, one showing the leaf and one the flower. The flower plate bears the date October 1, 1805. This is the day on which the first copy was printed, and is given in accordance with an act of parliament relating to copyrights. Both plates bear the name *Castalia magnifica*. In the text on the second page following the plate, the plant is described as *Castalia magnifica*. As a synonym the name *Nymphaea rubra* Roxb. MSS. is given, and by this name the plant has ever since been known whenever it has been referred to the genus *Nymphaea*.<sup>1</sup>

There is no doubt, however, that Salisbury was the first to publish a binomial name for the crimson Indian waterlily. According to the International Rules (Art. 35, 37) Roxburgh's manuscript name, first published in synonymy, is not valid. We must, therefore, return to Salisbury's specific name, thus:

***Nymphaea magnifica*** (Salisb.), comb. nov. *Castalia magnifica* Salisb. in Hook. Parad. Lond. i. t. 14 (1805). *N. rubra* Roxb. ex Salisb. l. c. in synonym. 1805 et auct. plur.—HENRY S. CONRAD.

<sup>1</sup> In a paper to appear shortly in this journal reasons will be given for holding to the generic names *Nymphaea* and *Nuphar*.